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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/527,911	11/07/2005	Michael James Knee	P-7786-US	9050

49443 7590 04/10/2009

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EXAMINER	
YEH, EUENG NAN	

ART UNIT	PAPER NUMBER
2624	

MAIL DATE	DELIVERY MODE
04/10/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/527,911	KNEE ET AL.	
	Examiner	**Art Unit**	
	EUENG-NAN YEH	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _30 January 2009_.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-12,21 and 24-32_ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1-12,21 and 24-32_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on _30 January 2009_ is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _March 14, 2005_.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on January 30, 2009 has been entered.

Claim Rejections - 35 USC § 101

2. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

3. Claims 1 (and therefore 2-12, 24-32 by dependency) and 21 are rejected under 35 U.S.C. 101 as not falling within one of the four statutory categories of invention. Supreme Court precedent (*Diamond v. Diehr*, 450 U.S. 175, 184 (1981); *Parker v. Flook*, 437 U.S. 584, 588 n.9 (1978); *Gottschalk v. Benson*, 409 U.S. 63, 70 (1972); *Cochrane v. Deener*, 94 U.S. 780, 787-88 (1876)) and recent Federal Circuit decisions (*In re Bilski*, 88 USPQ2d 1385 (Fed. Cir.

2008)) indicate that a statutory “process” under 35 U.S.C. 101 must (1) be tied to another statutory category (such as a particular apparatus), or (2) transform underlying subject matter (such as an article or material) to a different state or thing. While the instant claims recite a series of steps or acts to be performed, the claims neither transform underlying subject matter nor positively tie to another statutory category that accomplishes the claimed method steps, and therefore do not qualify as a statutory process. In order for a process to be “tied” to another statutory category, the structure associated with another statutory category must be positively recited in a step or steps significant to the basic inventive concept, and NOT just in association with statements of intended use or purpose, insignificant pre or post solution activity, or implicitly. For example method claim 1 performs the steps comprising: representing data points in a segmentation space, representing segments as locations in segmentation space, and determining membership, wherein none of above steps positively "tied" to another statutory category. Secondly, a qualifying transformation is NOT recited for at least the reason that the data is not claimed as representing a physical object or substance. Furthermore, there is no external depiction of the transformed/modified data, such as but not limited to a visual display.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1-4, 6-8, 12, 24-27, and 29-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Castagno et al. (IEEE Vol. 8, No. 5, Sep. 1998, 562-571), Park et al. (US 6,535,632 B1), and Trew et al. (US 6,173,077 B1).

Regarding claims 1, Castagno discloses a segmentation system comprising:

- representing the data as points in a segmentation vector space which is the product of the vector space of feature values and the vector space of pixel addresses (as depicted in figure 2, “Fig. 2 shows a segmentation at the region level. For the sake of simplicity, we have selected a case in which the coherence within each region is based on gray level and color” at page 564, right column, line 1. See also “We have tested approximately 20 different features, chosen among color components (such as RGB, YUV, LSH, normalized RGB, and others), displacement values (the horizontal and vertical components of the optical flow), position values (the absolute x and y coordinates), and texture information …” at page 565, left column, bottom paragraph);

- representing segments as locations in the segmentation vector space (as depicted in figures 3-5: “Figs. 3–5 show three examples of how the same segmentation at the region level can yield different segmentations at the object level” at page 564, right column, line 4. See also “We have tested approximately 20 different features,

chosen among color components (such as RGB, YUV, LSH, normalized RGB, and others), displacement values (the horizontal and vertical components of the optical flow), position values (the absolute x and y coordinates), and texture information …" at page 565, left column, bottom paragraph);

- determining a segment for each pixel by the distance in segmentation vector space from the data point representing the pixel to the location of the segment ("The features that we propose to use in our segmentation scheme belong to four groups (color, motion, position, and texture). Each one is characterized by quite different ranges of possible values … In order to process this information in parallel, it is therefore necessary to introduce some form of normalization that allows us to define a distance which is easily measurable. A common solution is known as Mahalanobis distance … The use of the Mahalanobis distance therefore induces a distance between two vectors f_m and f_n in the feature vector space …" at page 565, right column, bottom paragraph).

Castagno suggests motion and position as features of segmentation vector space. Castagno does not explicitly disclose that distance can be used as membership measurement in the segmentation vector space. Furthermore, Castagno does not explicitly disclose displaced frame difference, DFD, in segmentation vector space and how to calculate DFD.

Park, in the same field of endeavor of color image processing ("object tracking and image segmentation" at column 1, line 27), teaches the cluster segmentation determination as depicted in figure 10: "process for allocating input vectors into clusters

is performed for each input vector (step 84). Such process is based upon a minimum distance measure. In various embodiments an euclidean distance, an absolute distance or some other distance measure is used. In one embodiment the euclidean distance is used. An input vector is allocated to a cluster to which it has a minimal euclidean distance with the cluster's prototype vector. At step 86, the prototype vector closest to the input vector is found. As a self-organizing control for allocating data into clusters, a vigilance parameter, also referred to herein as a vigilance value, is used. A vigilance test is performed at step 88. If the minimum euclidean distance is not less than the vigilance value, then a new cluster is defined at step 90. The input vector is assigned to such new cluster and becomes the initial prototype vector for such new cluster. If the minimum euclidean distance is less than the vigilance value, then the input vector is assigned to the cluster corresponding to the closest prototype vector at step 92 …" at column 10, line 37. Thus, the distance determines the membership of input vector.

It would have been obvious at the time the invention was made, that one of ordinary skill in the art would have been motivated to include the segmentation system Castagno made with membership determination algorithm as taught by Park, in order to properly classify each segment such that "an input vector is allocated to a preexisting cluster or a new cluster" at column 10, line 55.

The combination of Castagno and Park does not explicitly disclose how to calculate displaced frame difference, DFD, and DFD is one of the feature values.

Trew, in the field of endeavor of image segmentation ("present invention aims to provide an approach to temporally consistent segmentation" at column 2, line 15),

suggests, “[i]n order to detect inaccurate motion vectors the embodiment calculates a displaced frame difference (DFD) of each pixel. The DFD represents per pixel the error between a frame and the estimate of that frame provided by the motion vectors based on the neighbouring frames. An excessive DFD may thus indicate that the motion vectors for a particular pixel are invalid. The DFD is then used to identify where the segmentation predicted by the motion vectors requires correction” at column 3, line 7. See also figure 3 and column 6, line 66 to column 8, line 7 for displaced frame difference operation.

It would have been obvious at the time the invention was made, that one of ordinary skill in the art would have been motivated to include the segmentation system of the Castagno and Park combination, with displaced frame difference (DFD) as one of the feature values as taught by Trew, such that “[t]he DFD is then used to identify where the segmentation predicted by the motion vectors requires correction” at column 3, line 13.

Regarding claim 2, the segments are represented as points (as depicted in Castagno figure 2, “Fig. 2 shows a segmentation at the region level …” at page 564, right column, line 1. The segments are represented as points).

Regarding claim 3, the segments are represented as linear functions mapping the vector space of pixel locations to the vector space of pixel values (as depicted in Castagno figure 2, segmented pixel point position (x, y) maps and one-to-one

corresponds to the gray level value of the image. “Fig. 2 shows a segmentation at the region level … each region is based on gray level and color” at page 564, right column, line 1).

Regarding claim 4, the distance measure is a Euclidean distance (discussed in claim 1, “…Such process is based upon a minimum distance measure. In various embodiments an euclidean distance, an absolute distance or some other distance measure is used. In one embodiment the euclidean distance is used. …” at Park column 10, line 38).

Regarding claim 6, the coordinate axes are scaled to equalize the variances of the data along each axis (“The features that we propose to use in our segmentation scheme belong to four groups (color, motion, position, and texture). Each one is characterized by quite different ranges of possible values: color information typically ranges from 0 to 255, motion spans a more limited interval (for example, pixels/frame), the x and y coordinates are limited by the size of the image, while the texture information shows the biggest variations. In order to process this information in parallel, it is therefore necessary to introduce some form of normalization that allows us to define a distance which is easily measurable” at Castagno page 565, right column, bottom paragraph. The variance is used in equation 3 at page 565).

Regarding claim 7, the coordinate axes are scaled in order to minimize the product of errors evaluated along each axis, with the constraint that the scaling factors sum to a constant value ("In the experiments, we gave a weight of 10% to the position information (x and y coordinates), and 5% to the texture information. The motion and the color information adaptively share the remaining 85% according to their reliability, with the qualitative behavior shown in Fig. 8" at Castagno page 568, right column, line 3. Thus, the total weighting sum is 100% and "allocates relative weight to features according to their local degree of reliability" at page 566, left column, line 25. The reliability i.e. minimize the product of errors is discussed at page 567, in Section III-E3 "Confidence Measure Derived from the Optical Flow Estimation Method").

Regarding claim 8, the distance measure is a Mahalanobis distance (discussed in claim 1, "…A common solution is known as Mahalanobis distance …" at Castagno page 565, right column, line 41).

Regarding claims 12, for each picture of initially assigning pixels to segments according to the segment membership of the respective pixel in the preceding picture in the sequence ("…The segmentation results obtained for the current frame are eventually used as initialization for the FCM procedure at frame n+1 …" at Castagno page 568, right column, line 42. Thus, the initially assigning pixels to segments is taken from the preceding picture).

Regarding claim 24, each pixel is chosen to be a member of a single segment determined by minimizing the distance measure ("… An input vector is allocated to a cluster to which it has a minimal euclidean distance with the cluster's prototype vector …" at Park column 10, line 42.)

Regarding claim 25, the number of segments is chosen by the user ("We define a region as an area of the frame which homogeneous according to given quantitative criteria, such as gray level, color, texture, motion, or—in the most general case—a combination of them" at Castagno page 564, left column, line 1. Thus, the user defines regions of the frame).

Regarding claim 26, the number of segments is chosen as a function of the input data ("Our definition of object is in full accordance with the concept of video object as defined in the framework of MPEG-4, 'an entity in a scene that a user is allowed to access (seek, browse), and manipulate (cut and paste)' … objects are strongly characterized by their semantic content …" at Castagno page 564, left column, line 7. See also "In one implementation for a sequence of image frames, such filtering allows for improved image object tracking ability and improved image object segmentation" at Park column 2, line 46. Thus, the quality and characteristic of data can affect the number of segments).

Regarding claim 27, the number of segments is chosen so that the variance of an overall error measure approaches a predetermined value ("…introduction of a spatial constraint that biases the algorithm so as to encourage adjacent pixels to be assigned to the same class. The proposed modification, called constrained fuzzy C-means (CFCM) … In our approach, the standard FCM algorithm is used to obtain an initial segmentation, and the spatial constraint is introduced in a second round of iterations aimed at refining the result" at Castagno page 568, right column, line 22).

Regarding claim 29, the representations of segments in the vector space are updated according to the segment membership of pixels ("As is the case for the FCM algorithm, the fuzzy partition of the data set can be obtained by iteratively updating the centroids and the degree of belongingness of each vector to the classes" at Castagno page 568, right column, line 32. This is to say that the fuzzy partition of the data set which represents the segment in the vector space is updated according to the degree of belongingness of each vector to the classes).

Regarding claim 30, the processes of assigning pixels to segments and of updating the representations of segments are repeated alternately ("As is the case for the FCM algorithm, the fuzzy partition of the data set can be obtained by iteratively updating the centroids and the degree of belongingness of each vector to the classes" at Castagno page 568, right column, line 32. This is to say that the degree of

belongingness of each vector which assigns pixels to segments and the centroids of the fuzzy partition of the data set which represents the segment are iteratively updated).

Regarding claim 31, the initial segmentation is taken from the previous picture in a sequence of pictures ("…The segmentation results obtained for the current frame are eventually used as initialization for the FCM procedure at frame n+1 …" at Castagno page 568, right column, line 42. Thus, the initial segmentation is taken from the previous picture).

Regarding claim 32, the displaced frame differences are calculated by applying motion vectors derived from the current state of the segmentation to the input pixel data ("In order to detect inaccurate motion vectors the embodiment calculates a displaced frame difference (DFD) of each pixel. The DFD represents per pixel the error between a frame and the estimate of that frame provided by the motion vectors … The DFD is then used to identify where the segmentation predicted by the motion vectors requires correction" at Trew column 3, line 7).

6. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Castagno, Park, and Trew as applied to claim 1 discussed above, and further in view of Aggarwal et al. (US 6,728,706 B2).

Regarding claim 5, the Castagno, Park, and Trew combination teaches that the distance used can be Euclidean or Mahalanobis. The Castagno, Park, and Trew combination does not explicitly teach the Manhattan distance.

Aggarwal, in the file of endeavor of image similarity search ("Similarity searches are performed on the basis of similarity functions" at column 4, line 24), teaches distance metrics, such as Manhattan distance, used to determine the similarity during search phase: "In this feature space, each product is represented by a feature vector corresponding to the feature values extracted for it in step 240 *(figure 2)*" at column 7, line 8. Furthermore, "feature values in the database will have different ranges, for example, (maximum value over the entire database--minimum value over the entire database). Consequently, features with a larger range dominate over a feature with smaller range when, for example, Manhattan, Euclidean, or Mahalanobis distance metrics are used for determining the similarity between two products during the search phase" at column 7, line 46.

It would have been obvious at the time the invention was made to one of ordinary skill in the art to be motivated to include the segmentation system of the Castagno, Park, and Trew combination with Manhattan distance metric as taught by Aggarwal, not only for its mathematical simplicity and calculatingly fast but also to ensure that "none of the features are given undue importance when calculating similarity metrics" at column 7, line 59.

7. Claims 9-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Castagno, Park, and Trew as applied to claim 1 discussed above, and further in view of Price et al. (US 5,606,164).

Regarding claim 9, the Castagno, Park, and Trew combination teaches: - measuring a distance in segmentation vector space of each pixel to each segment location to determine the membership (discussed in claim 1, for determining the membership of a segment).

The Castagno, Park, and Trew combination does not explicitly disclose the usage of covariance matrix.

Price, in the field of endeavor of data analysis ("measuring biological fluid analyze concentration using outlier identification and removal based on generalized distances" at column 3, line 12), discloses the usage of principal component analysis on the generalized distances: "… the calibration data set may be reduced to significant factors using principal component analysis or partial least squares scores, enabling calculation of regression coefficients and artificial neural network weights" at column 3, line 38. And "… generalized distance between a sample and the centroid defined by a set of samples may be determined using the variance-covariance matrix of the set of samples … Further, by using principal component scores to represent spectral data for each sample, independent variables maximizing the information content may be obtained, insuring an invertible approximate variance-covariance matrix. With respect to Mahalanobis distance, an approximate centroid may be determined as the centroid of a multivariate normal distribution of the set of calibration samples and an approximate

variance-covariance matrix of the set of calibration samples, whereby an approximate Mahalanobis distances in units of standard deviations measured between the centroid and each calibration sample may be found …" at column 5, line 17. Thus, Price teaches:

a) determining a covariance matrix of the image data in each segment;

b) distance determined using variance-covariance matrix.

It would have been obvious at the time the invention was made, that one of ordinary skill in the art would have been motivated to include the segmentation system of the Castagno, Park, and Trew combination with covariance matrix application as taught by Price, such that by "using principal component scores to represent spectral data for each sample, independent variables maximizing the information content may be obtained, insuring an invertible approximate variance-covariance matrix" at column 5, line 25.

Regarding claim 10, covariance matrix (discussed at Price column 11, equation (7), where S is the covariance matrix).

Regarding claim 11, distance measurement (discussed at Price column 11, equation (6) for the Mahalanobis distances).

8. Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Castagno, Park, and Trew as applied to claims 1, 25, 26, and 27 discussed above, and further in view of Penn (US 5,848,198).

Regarding claim 28, the combination of Castagno, Park, and Trew teaches segmentation processing with chosen number of segments as discussed in claims 25, 26 and 27. The Castagno, Park, and Trew combination does not explicitly teach that the process can be in parallel.

Penn, in the field of endeavor of processing digitized images ("for detecting, identifying, and analyzing anomalies and abnormalities within the images" at column 1, line 12), provides "a new and improved method of and apparatus for achieving significant reduction in image data processing time by using a methodology which is amenable to parallel processing …" at column 16, line 27. The processing involves such as "…(iii) a coded method of segmenting the Analysis Image according to the locations of the fractal-like forms. (iv) a coded procedure for obtaining a set of binary images for each segment …" at column 7, line 61. Furthermore, "determine a relative merit of the performance measure, a 'best measure' is initialized either high or low as per the specification and stored in computer memory 32 *(figure 1)* …" at column 26, line 39.

It would have been obvious at the time the invention was made, that one of ordinary skill in the art would have been motivated to include the segmentation system of the Castagno, Park, and Trew combination with parallel processing methodology as

taught by Penn, for the purpose of “achieving significant reduction in image data processing time” at column 16, line 18.

9. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Castagno et al. (IEEE Vol. 8, No. 5, Sep. 1998, 562-571), Park et al. (US 6,535,632 B1), and Min et al. (International Conference on Pattern Recognition, Vol. 1, September 3-7, 2000, pp. 644-647).

Regarding claim 21, Castagno discloses a segmentation system comprising:

- representing the image data as points in a segmentation vector space which is the product of the vector space of feature values and the vector, space of pixel addresses (as depicted in Castagno figure 2, “Fig. 2 shows a segmentation at the region level. For the sake of simplicity, we have selected a case in which the coherence within each region is based on gray level and color” at Castagno page 564, right column, line 1. See also “We have tested approximately 20 different features, chosen among color components (such as RGB, YUV, LSH, normalized RGB, and others), displacement values (the horizontal and vertical components of the optical flow), position values (the absolute x and y coordinates), and texture information …” at Castagno page 565, left column, bottom paragraph);

- initially assigning pixels to segments represented as locations in the segmentation vector space (as depicted in Castagno figures 2-5: “Fig. 2 show a segmentation at the region level. For the sake of simplicity, we have selected a case in which the coherence within each region is based on gray level and color” at Castagno

page 564, right column, line 1. The assigned segments will be represented as locations in the segmentation vector space: "Figs. 3–5 show three examples of how the same segmentation at the region level can yield different segmentations at the object level" at Castagno page 564, right column, line 4. See also "We have tested approximately 20 different features, chosen among color components (such as RGB, YUV, LSH, normalized RGB, and others), displacement values (the horizontal and vertical components of the optical flow), position values (the absolute x and y coordinates), and texture information …" at Castagno page 565, left column, bottom paragraph);

- determining a segment for each pixel according to a distance measure from the data point representing the pixel to the representation of the segment ("The features that we propose to use in our segmentation scheme belong to four groups (color, motion, position, and texture). Each one is characterized by quite different ranges of possible values … In order to process this information in parallel, it is therefore necessary to introduce some form of normalization that allows us to define a distance which is easily measurable. A common solution is known as Mahalanobis distance … The use of the Mahalanobis distance therefore induces a distance between two vectors f_m and f_n in the feature vector space …" at page 565, right column, bottom paragraph).

Castagno suggests motion and position as features of segmentation vector space. Castagno does not explicitly disclose that distance can be used as membership measurement in the segmentation vector space. Furthermore, Castagno does not disclose the data can be in a toroidal space.

Park, in the same field of endeavor of color image processing ("object tracking and image segmentation" at column 1, line 27), teaches the cluster segmentation determination as depicted in figure 10: "process for allocating input vectors into clusters is performed for each input vector (step 84). Such process is based upon a minimum distance measure. In various embodiments an euclidean distance, an absolute distance or some other distance measure is used. In one embodiment the euclidean distance is used. An input vector is allocated to a cluster to which it has a minimal euclidean distance with the cluster's prototype vector. At step 86, the prototype vector closest to the input vector is found. As a self-organizing control for allocating data into clusters, a vigilance parameter, also referred to herein as a vigilance value, is used. A vigilance test is performed at step 88. If the minimum euclidean distance is not less than the vigilance value, then a new cluster is defined at step 90. The input vector is assigned to such new cluster and becomes the initial prototype vector for such new cluster. If the minimum euclidean distance is less than the vigilance value, then the input vector is assigned to the cluster corresponding to the closest prototype vector at step 92 …" at column 10, line 37. Thus, the distance determines the membership of input vector.

It would have been obvious at the time the invention was made, that one of ordinary skill in the art would have been motivated to include the segmentation system Castagno made with membership determination algorithm as taught by Park, in order to properly classify each segment such that "an input vector is allocated to a preexisting cluster or a new cluster" at column 10, line 55.

The combination of Castagno and Park does not explicitly disclose the toroidal data space.

Min, in the field of endeavor of image segmentation ("We have developed an automated framework for performance evaluation of curved-surface range image segmentation algorithms" at Min page 644, abstract), teaches curved-surface segmentation, "[t]he image dataset includes planar, spherical, cylindrical, conical, and toroidal surfaces …" at page 644, abstract. "We compared two curved-surface range segmentation algorithms, The Jiang and Bunke algorithm gives a higher rate of correctly segmented regions and has a much faster execution time …" at page 646, section 6, second paragraph.

It would have been obvious at the time the invention was made, that one of ordinary skill in the art would have been motivated to include the segmentation system of the Castagno and Park combination, with curved-surface segmentation such as toroidal surface as taught by Min, so the segmentation needs not be limited to planar region as discussed above.

Response to Arguments

a) Summary of Applicant's Remark:

The previous drawing objections should be withdrawn in view of the amendment.

Examiner's Response:

Examiner agrees, and the previous drawing objections are withdrawn.

b) Summary of Applicant's Remark:

"Applicants repeat that there is nothing in Bierling, in Castagno or in Park that suggests that the DFD value mentioned in Bierling should be included in a distance in segmentation vector space in an image segmentation process" at response page 11, line 27.

Examiner's Response:

Applicant's argument is moot in view of the new grounds of rejection advanced herein above. Specifically, the Trew et al. (US 6,173,077 B1) reference now teaches the concept of displaced frame difference. Refer to the rejections above for further discussion.

c) Summary of Applicant's Remark:

"The claim limitation of representing the image data of points in a segmentation vector space in a toroidal canvas is clear and it is clear that the claim limitation is not met by displaying a visual image through a toroidal lens" at response page 12, item (f).

Examiner's Response:

Applicant's argument is moot in view of the new grounds of rejection advanced herein above. Specifically, the Min et al. (International Conference on Pattern Recognition, Vol. 1, September 3-7, 2000, pp. 644-647) reference now teaches the concept of toroidal space segmentation. Refer to the rejections above for further discussion.

Conclusion

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eueng-nan Yeh whose telephone number is 571-270-1586. The examiner can normally be reached on Monday-Friday 8AM-4:30PM EDT.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vikkram Bali can be reached on 571-272-7415. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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